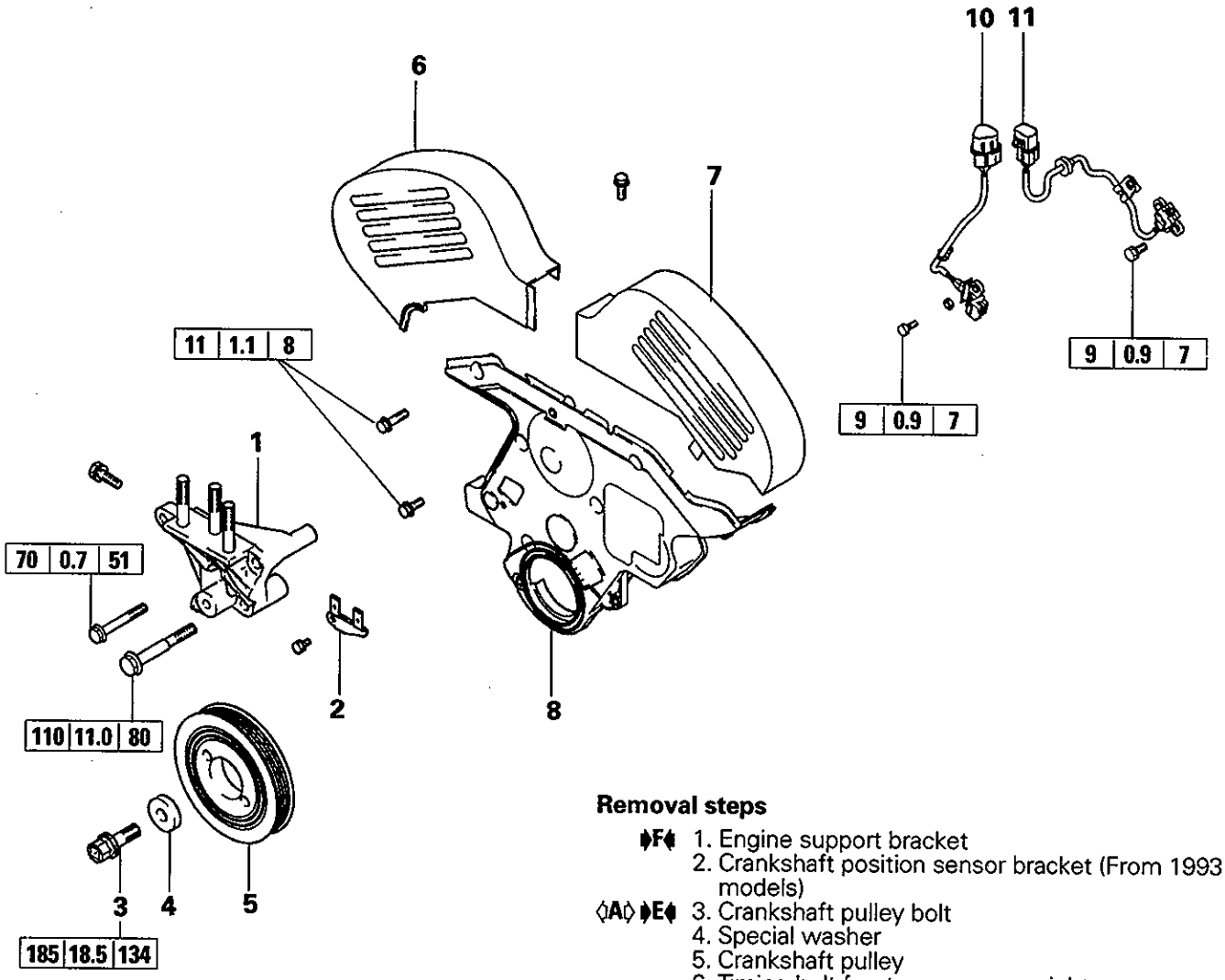
6. TIMING BELT (FOUR-CAMSHAFT ENGINE)

REMOVAL AND INSTALLATION

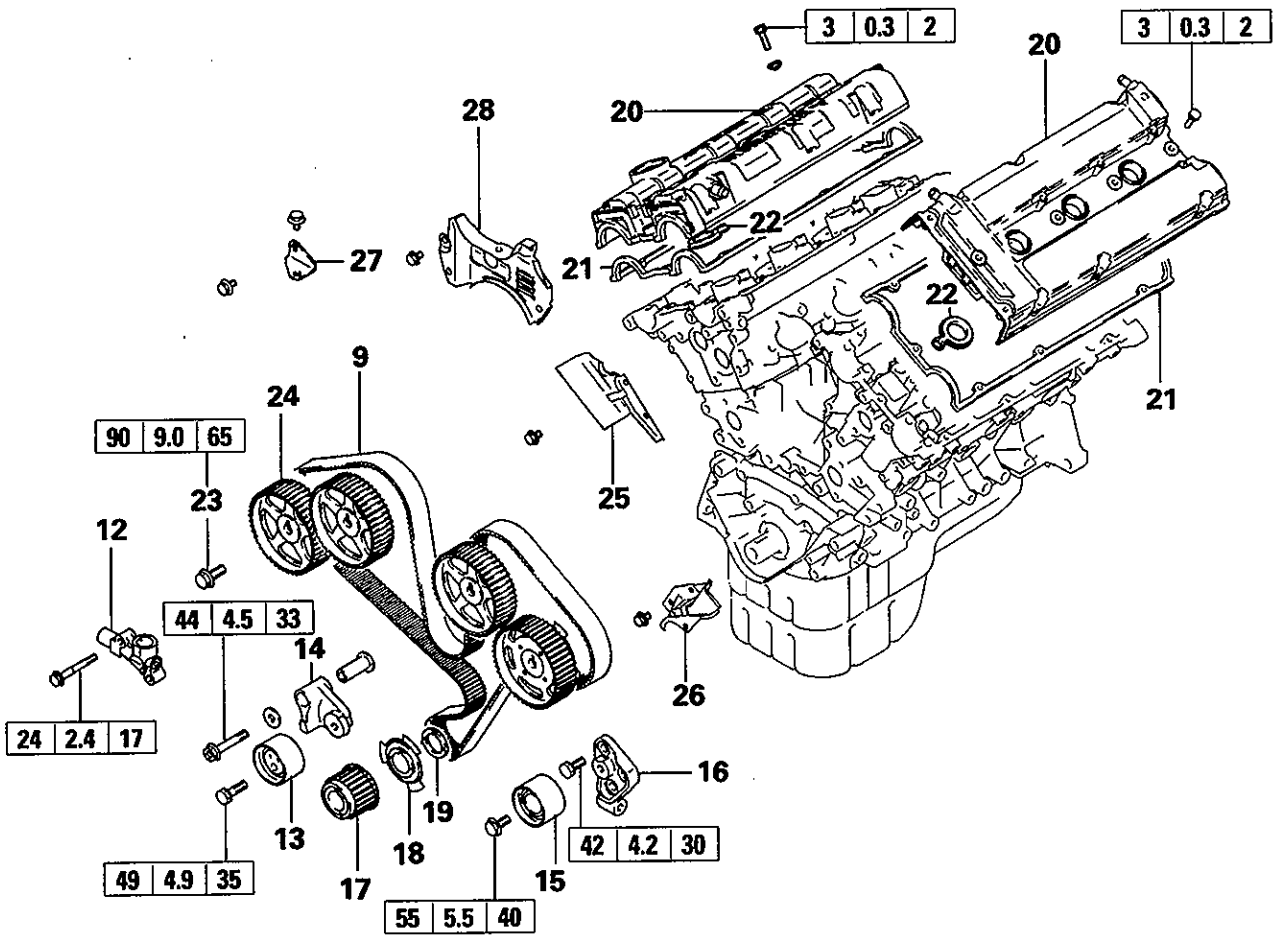
(Front wheel drive vehicle)



Removal steps

- ◆F◆ 1. Engine support bracket
  2. Crankshaft position sensor bracket (From 1993 models)
- ◇A◇ ◆E◆ 3. Crankshaft pulley bolt
  4. Special washer
  5. Crankshaft pulley
  6. Timing belt front upper cover, right
  7. Timing belt front upper cover, left
  8. Timing belt front lower cover
- ◇B◇ ◆D◆ 9. Timing belt
  10. Crankshaft position sensor (From 1993 models)
  11. Camshaft position sensor (From 1993 models)
- ◆B◆ 12. Auto tensioner
  13. Tensioner pulley
  14. Tensioner arm assembly
  15. Idler pulley
  16. Idler pulley bracket
  17. Crankshaft sprocket
  18. Sensing plate (From 1993 models)
  19. Washer (From 1993 models)
- ◆C◆ 20. Rocker cover
  21. Rocker cover gasket, A
  22. Rocker cover gasket, B
- ◇C◇ ◆A◆ 23. Camshaft sprocket bolt
  24. Camshaft sprocket
  25. Timing belt rear cover, right
  26. Timing belt rear cover, left
  27. Bracket
  28. Timing belt rear cover, center

7EN0585


3 0.3 2
3 0.3 2
20
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28
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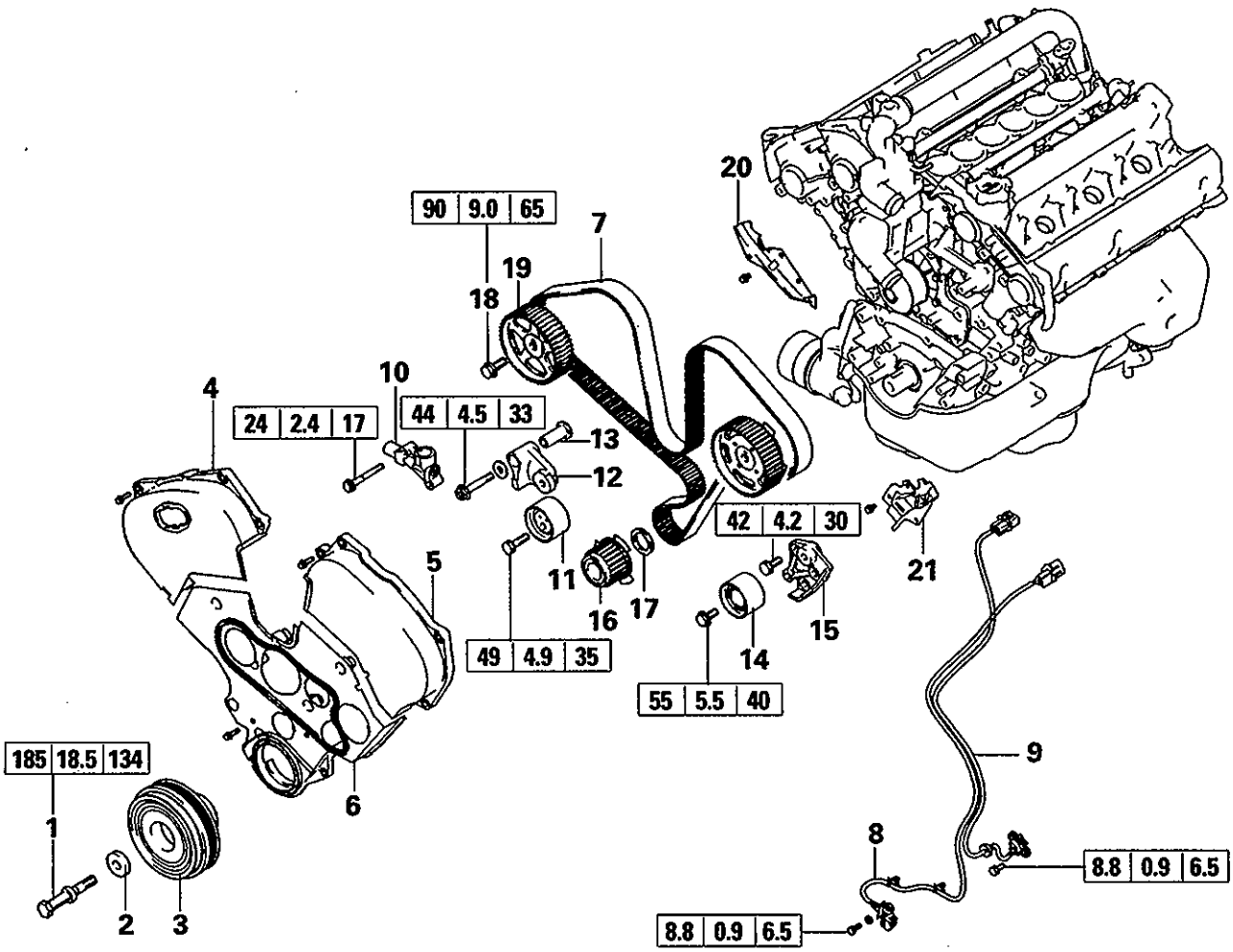
9
24
90 9.0 65
23
25
12
44 4.5 33
14
26
24 2.4 17
16
19
13
18
42 4.2 30
49 4.9 35
17
15
55 5.5 40

7EN0586

REMOVAL AND INSTALLATION

(Rear wheel drive vehicle)



Removal steps

◇A◇ ◆E◆ 1. Crankshaft pulley bolt
2. Crankshaft pulley washer
3. Damper pulley
4. Timing belt front upper cover, right
5. Timing belt front upper cover, left
6. Timing belt front lower cover

◇B◇ ◆D◆ 7. Timing belt
8. Crankshaft position sensor
9. Camshaft position sensor

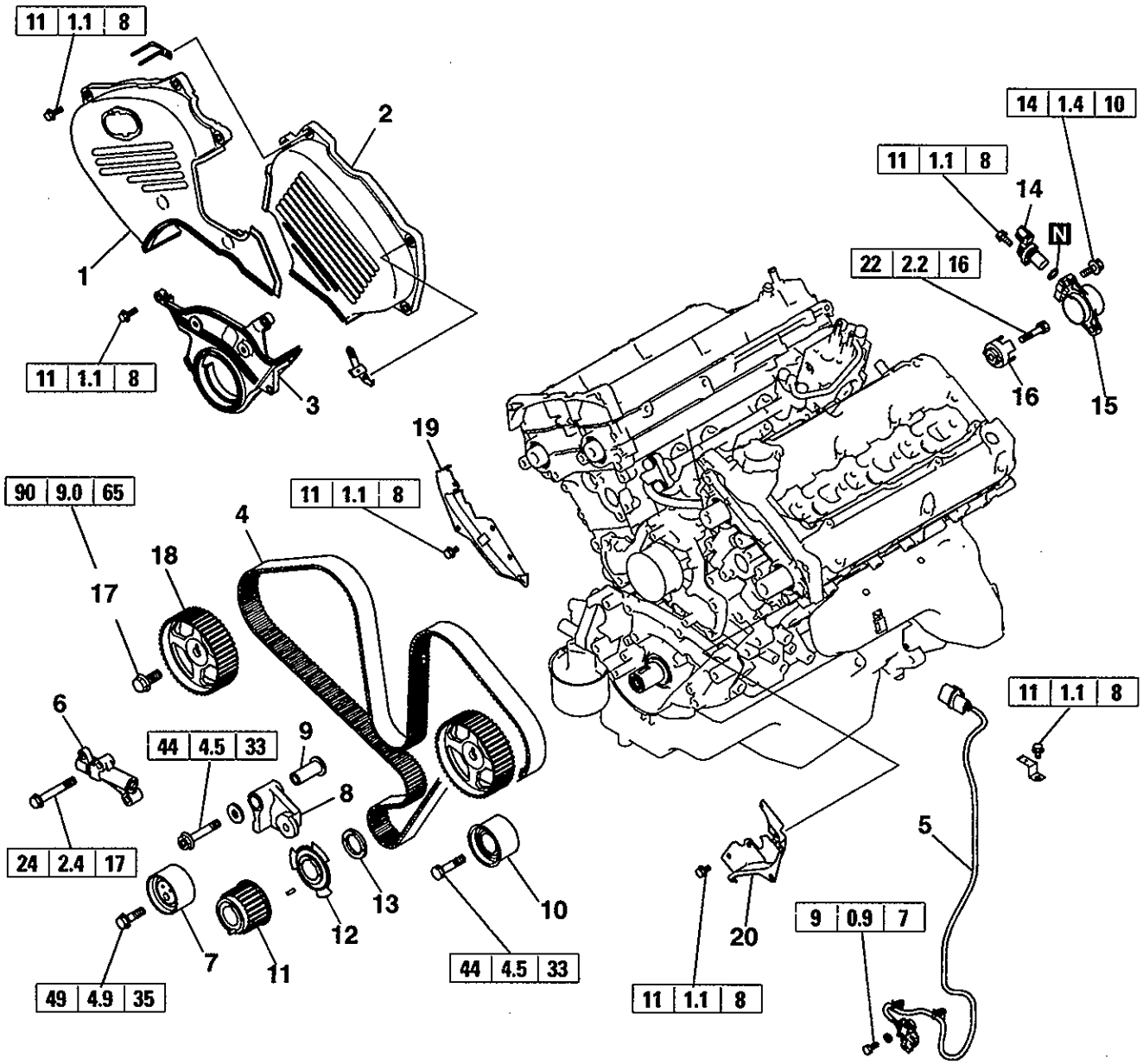
◆B◆ 10. Auto tensioner
11. Tensioner pulley
12. Tensioner arm
13. Shaft
14. Idler pulley
15. Idler pulley bracket
16. Crankshaft sprocket assembly
17. Crankshaft spacer

◇C◇ ◆A◆ 18. Camshaft sprocket bolt
19. Camshaft sprocket
20. Timing belt rear cover, right
21. Timing belt rear cover, left

7EN0682

REMOVAL AND INSTALLATION

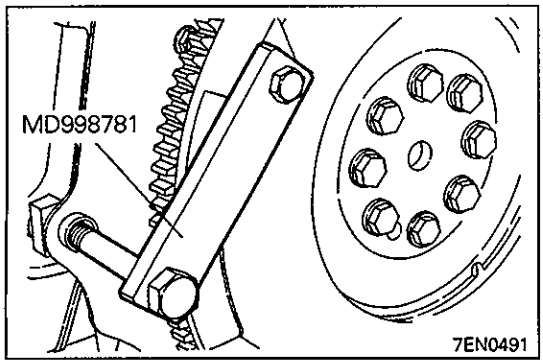
(GDI)



Removal steps

1. Timing belt front upper cover, right
2. Timing belt front upper cover, left
3. Timing belt front lower cover
◇B◇ ◆H◆ 4. Timing belt
5. Crankshaft position sensor
◆B◆ 6. Auto tensioner
7. Tensioner pulley
8. Tensioner arm
9. Shaft
10. Idler pulley
11. Crankshaft sprocket
12. Sensing plate
13. Spacer
14. Camshaft position sensor
15. Camshaft position sensor support
◇D◇ ◆G◆ 16. Camshaft position sensor sensing cylinder
◇C◇ ◆A◆ 17. Camshaft sprocket bolt
18. Camshaft sprocket
19. Timing belt rear cover, right
20. Timing belt rear cover, left

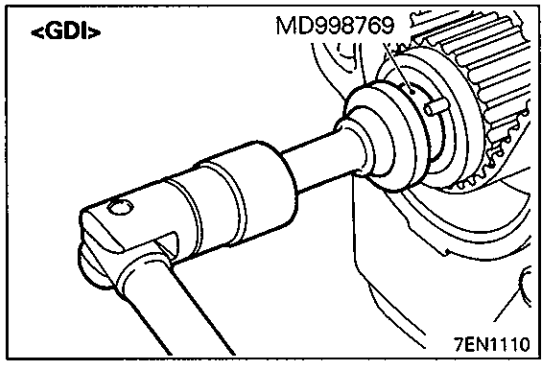
7EN1572



SERVICE POINTS OF REMOVAL

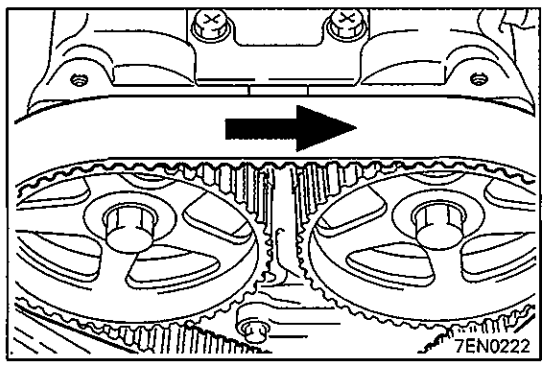
◇A◇ REMOVAL OF CRANKSHAFT PULLEY BOLT

(1) Using the special tool, hold the drive plate or flywheel.
(2) Remove the crankshaft bolt.



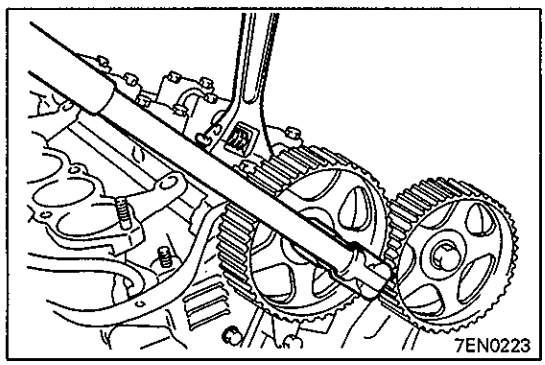
◇B◇ REMOVAL OF TIMING BELT

(1) Turn the crankshaft to bring the piston in No. 1 cylinder to its TDC on the compression stroke. <GDI>



(2) If reusing the timing belt, use a chalk to draw an arrow on back of the timing belt to indicate rotation direction.

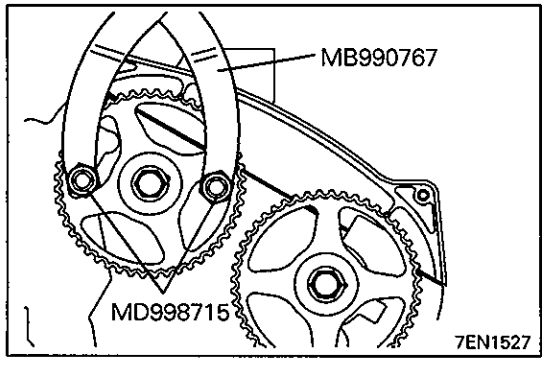
NOTE
(1) Water or oil on the belt shortens its life drastically, so the removed timing belt, sprocket, and tensioner must be kept free from oil and water. Do not immerse parts in cleaning solvent.
(2) If there is oil or water on any part, check the front case oil seal, camshaft oil seal and water pump for leaks.



◇C◇ REMOVAL OF CAMSHAFT SPROCKET BOLT

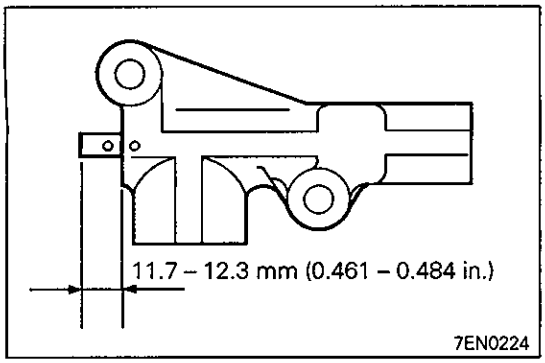
(1) While holding the hexagonal portion of the camshaft with a wrench, remove the camshaft sprocket bolt.

Caution
- **Using a holding tool on the camshaft sprocket could damage the sprocket teeth.**



◇D◇ REMOVAL OF CAMSHAFT POSITION SENSOR SENSING CYLINDER

(1) With the camshaft sprocket locked in position using the special tool, remove the camshaft position sensor sensing cylinder.



INSPECTION

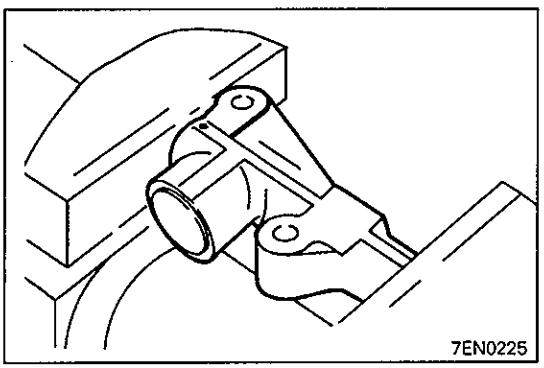
TIMING BELT

Refer to "INSPECTION" on page 11A-5-6.

AUTO-TENSIONER

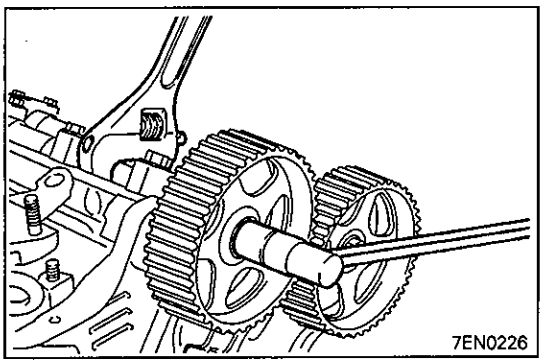
(1) Check for oil leaks. If oil leaks are evident, replace the auto-tensioner.
(2) Check the rod end for wear or damage and replace the auto-tensioner if necessary.
(3) Measure the rod projection length. If the reading is outside the standard value, replace the auto tensioner.

Standard value:
11.7 – 12.3 mm (0.461 – 0.484 in.)



(4) Use a vice to force the auto tensioner rod in. If the rod slides in easily, replace the tensioner. If there is nothing wrong, the rod will offer considerable resistance.

Caution
- **Set the auto tensioner in a vice, while making sure that the auto tensioner is not tilted.**

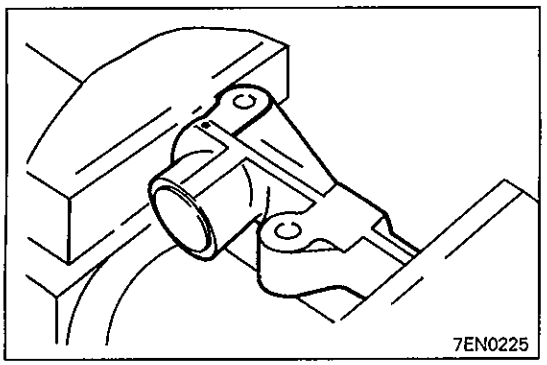


SERVICE POINTS OF INSTALLATION

◗A◖ INSTALLATION OF CAMSHAFT SPROCKET BOLT

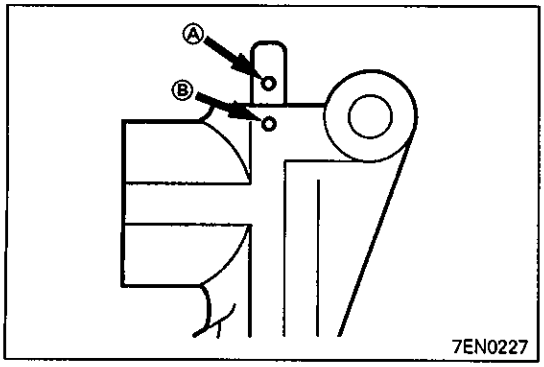
(1) While holding the hexagonal portion of the camshaft with a wrench, tighten the bolt to the specified torque.

Caution
- **Using a holding tool on the camshaft sprocket could damage the sprocket teeth.**



◗B◖ INSTALLATION OF AUTO-TENSIONER

(1) If the auto-tensioner rod is fully extended, set it in the retracted position with the following procedure.
  ① Set the auto tensioner in a vice, while making sure it is not tilted.

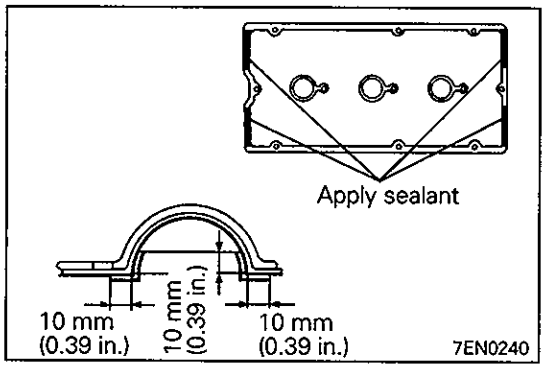


② Slowly close the vice to force the rod in until the set hole (A) of the rod is lined up with the set hole (B) of the cylinder.
③ Insert a metal wire [1.4 mm (0.055 in.) in diameter] into the set holes.
④ Remove the auto tensioner from the vice.

(2) On engines with turbocharger, apply sealant to the threads of the auto tensioner mounting bolt.

Specified sealant: 3M ATD Part No.8660 or equivalent.

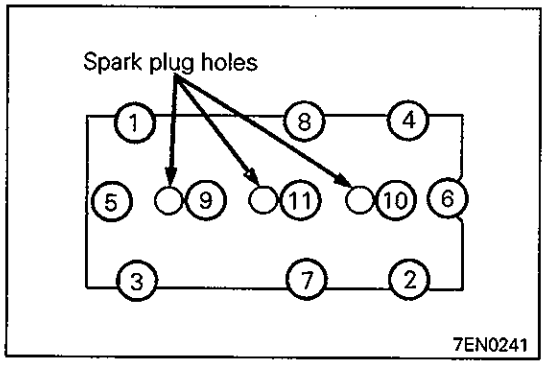
(3) Install the auto tensioner on the cylinder block through the oil pump case.



◆C◆ INSTALLATION OF ROCKER COVER

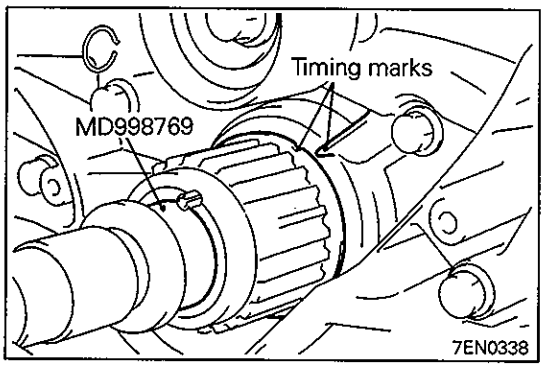
(1) Apply a sealant to the areas shown in the illustration.

Specified sealant: 3M ATD Part No.8660 or equivalent



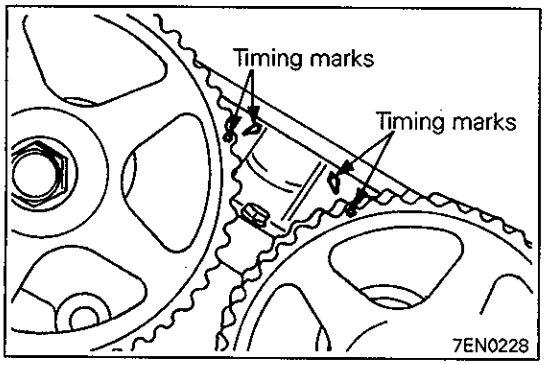
(2) Tighten the rocker cover bolts in the sequence shown in the illustration.

NOTE
The right and left bank bolts are painted in different colors for identification.
Right bank bolts ..... Black
Left bank bolts ..... Green

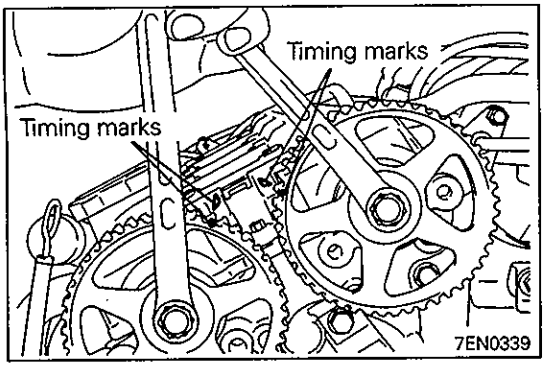


◆D◆ INSTALLATION OF TIMING BELT

(1) Using a special tool, line up the crankshaft sprocket timing marks, and then rotate the sprocket one tooth counter-clockwise.



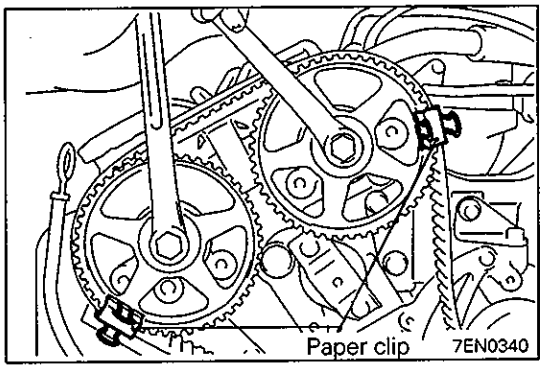
(2) Line up the timing marks of the camshaft sprockets for even-numbered cylinders on the rear (or left) bank.



(3) Using two wrenches, line up the timing marks of the camshaft sprockets for odd-numbered cylinders on the front (or right) bank.

Caution

- **Since valve spring force can turn the camshaft sprocket, be careful not to catch your finger.**
- **If either camshaft sprocket is rotated one complete turn clockwise or counterclockwise after lining up the timing marks of the other camshaft sprocket, the intake and exhaust valves might interfere. Consequently, if a camshaft sprocket was turned too far in lining up the timing marks, be sure to rotate it back from that position to line up again the timing marks.**

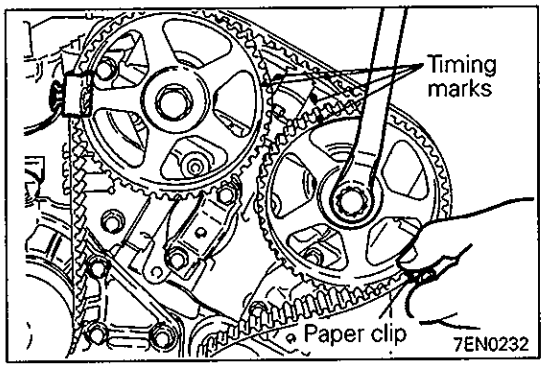


(4) Install the timing belt on the exhaust side camshaft sprocket for odd-numbered cylinders (on front or right bank) and hold it with a paper clip at the position shown in the illustration.

(5) Install the timing belt on the intake side camshaft sprocket and hold it with a paper clip at the positions shown in the illustration.

Caution

- **Since the camshaft sprocket turns easily, avoid excessive pulling on the timing belt.**

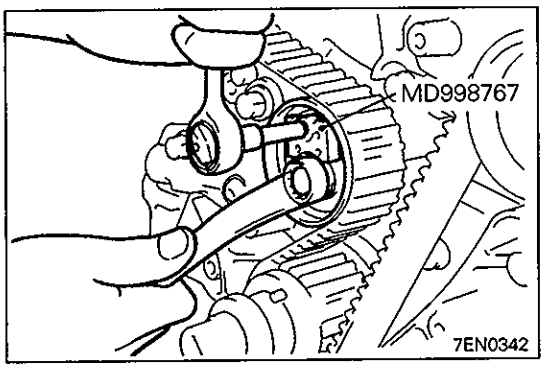


(6) Check that the timing marks of the camshaft sprockets for even-numbered cylinders (on rear or left bank) are in alignment. Then install the timing belt on these sprockets and hold it with a paper clip at the positions shown in the illustration.

(7) Install the timing belt on the idler pulley.

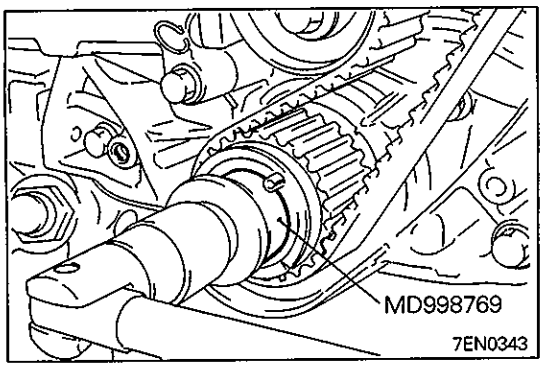
(8) Install the timing belt on the crankshaft sprocket.

(9) Install the timing belt on the tensioner pulley.

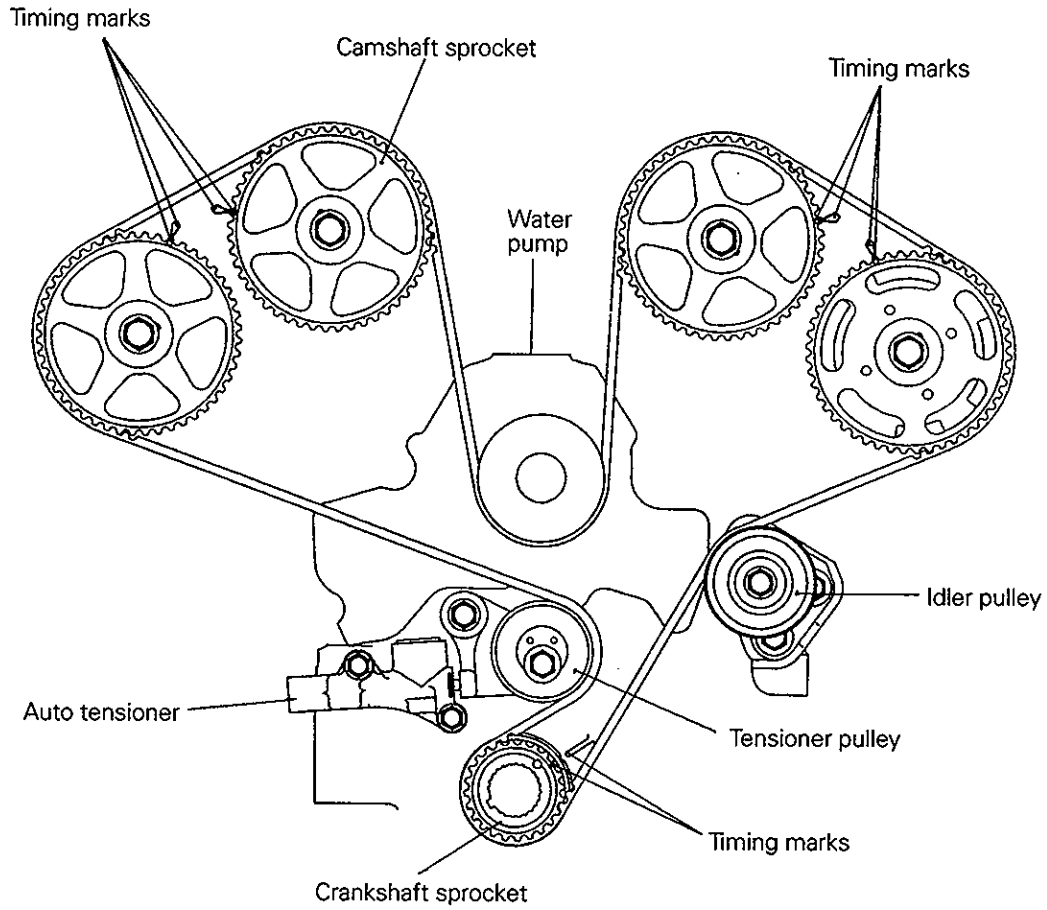


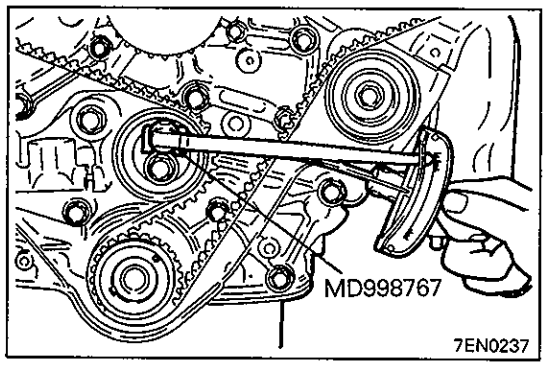
(10) While lightly pressing the tensioner pulley against the timing belt with the special tool, tighten the locking bolt temporarily.

(11) Remove the four paper clips.

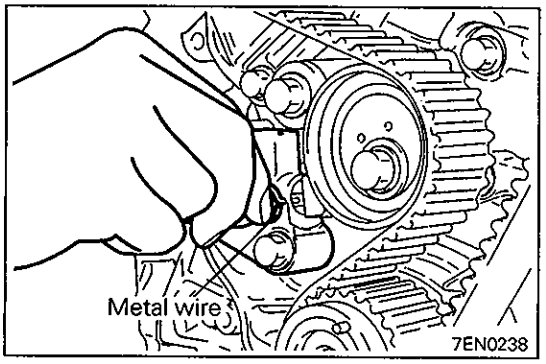


(12) Using a special tool, turn the crankshaft a quarter of a turn counterclockwise. Then rotate it clockwise to line up the timing marks and check that all the timing marks are in alignment.





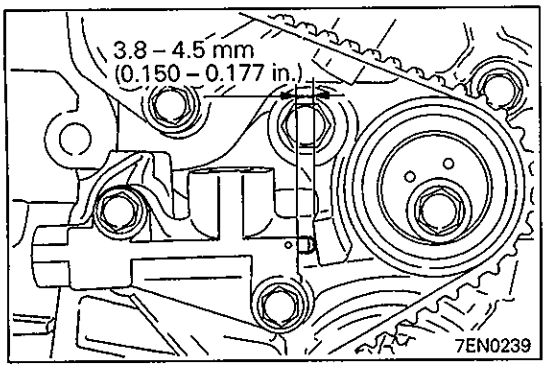
(13) Loosen the center bolt of the auto-tensioner pulley, and install a special tool and torque wrench on the pulley. While holding the pulley with approximately 9.8 Nm {1.0 kgfm, 7 ft.lbs.} (6G72·6G73) or 9.4 Nm {0.96 kgfm, 7 ft.lbs.} (6G74) torque to prevent it from turning, tighten the center bolt to the specified torque.



(14) Turn the crankshaft two turns clockwise, and leave it alone for about five minutes. Then move in and out the auto-tensioner setting metal wire to check that the wire moves smoothly.

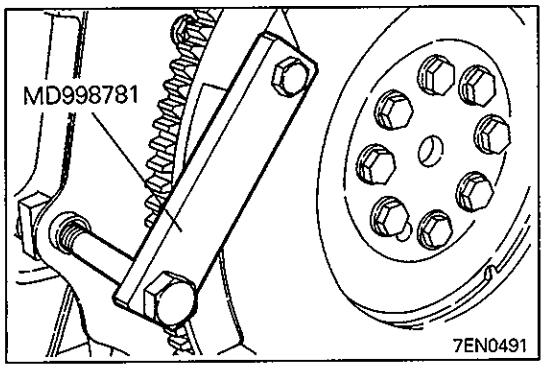
NOTE
If the metal wire does not move smoothly, repeat step (12) until it does move smoothly.

(15) Remove the auto tensioner setting metal wire.



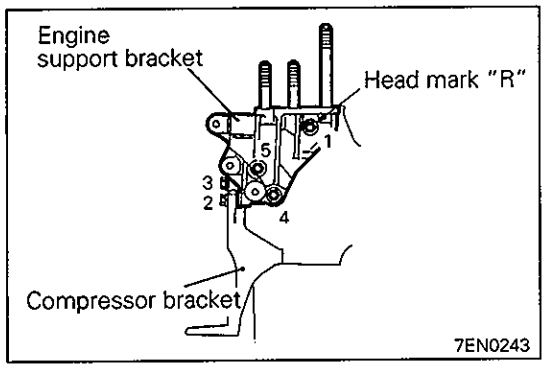
(16) Check that the spacing between the tensioner arm and auto tensioner is within the standard limit.

Standard value: 3.8 – 4.5 mm (0.150 – 0.177 in.)



◆E◆ INSTALLATION OF CRANKSHAFT PULLEY BOLT

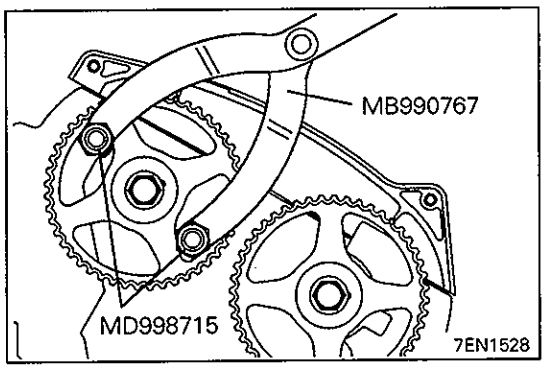
(1) Using the special tool, hold the drive plate or flywheel.
(2) Install the crankshaft bolt.



◆F◆ INSTALLATION OF ENGINE SUPPORT BRACKET

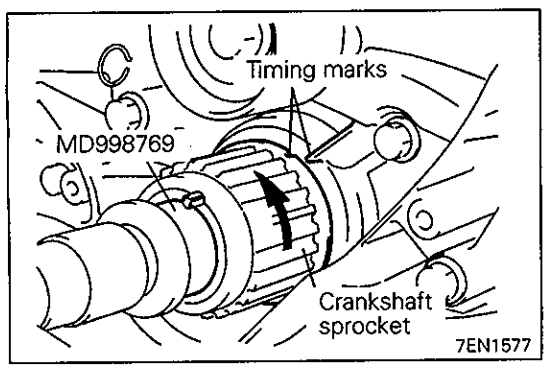
(1) Tighten the engine support bracket bolts in the order shown in the illustration.

NOTE
The bolt used at the location shown in the illustration is a reamer bolt (head mark "R").



◆G◆ INSTALLATION OF CAMSHAFT POSITION SENSOR SENSING CYLINDER

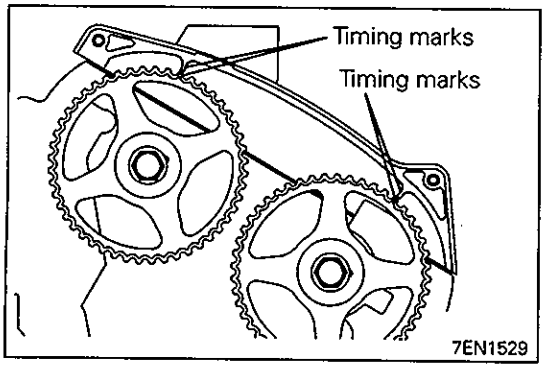
(1) With the camshaft sprocket locked in position using the special tool, install the camshaft position sensor sensing cylinder.



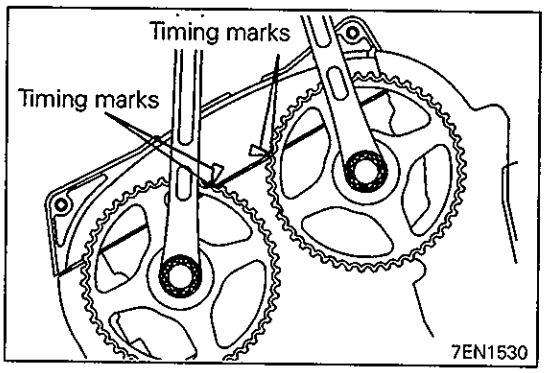
◆H◆ INSTALLATION OF TIMING BELT

(1) Turn the crankshaft sprocket so that its timing mark is off three teeth to slightly lower the piston in No. 1 cylinder from its TDC on the compression stroke.

Caution
- **There can be an interference between the valve and piston when the camshaft sprocket is turned with the piston in No. 1 cylinder at its TDC on the compression stroke.**



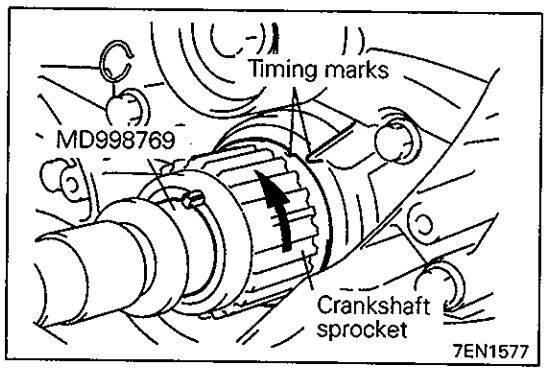
(2) Align the timing mark of the camshaft sprocket on the left bank side.



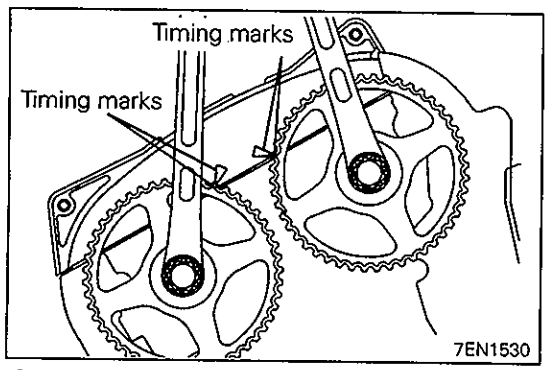
(3) Align the timing marks of the camshaft sprockets on the right bank side. When the special tool is removed, the sprocket turns by itself, letting the timing mark to deviate. Make necessary corrections, therefore, in step (5) to align the timing mark before installing the belt.

Caution

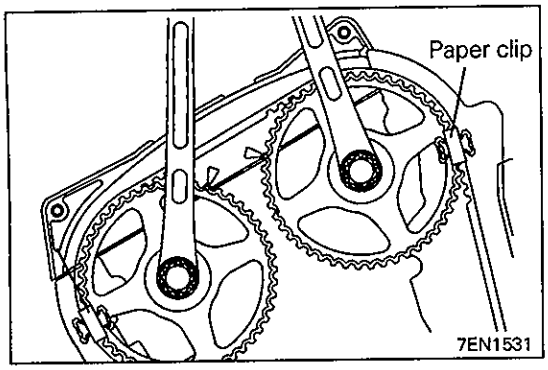
- **The camshaft sprockets on the right bank side are easy to turn because of the spring tension involved. Be careful not to allow your finger to be pinched in the mechanism.**
- **Do not attempt to turn one of the sprockets on the right side one turn with the timing mark of another one aligned. It may cause the intake and exhaust valves to interfere with each other.**



(4) Align the timing mark of the crankshaft sprocket. Then, turn the crankshaft sprocket one tooth counterclockwise.



(5) Align the timing marks of the camshaft sprockets on the right bank side and lock them in position with box wrenches.

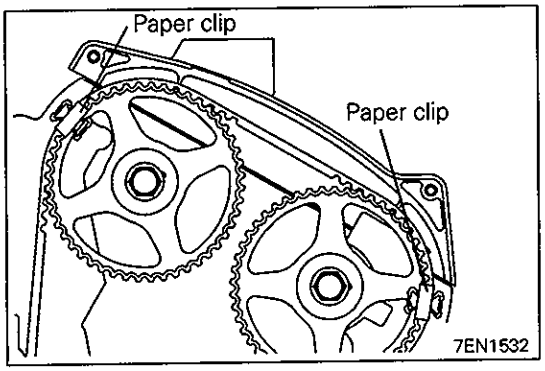


(6) Make sure that the timing mark of the exhaust camshaft sprocket on the right bank side is in alignment. Then install the timing belt over the sprocket and secure it with a paper clip.

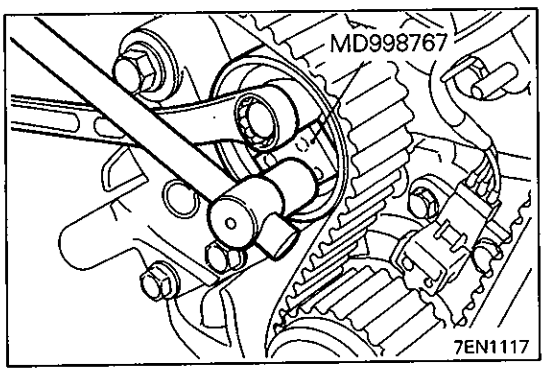
Caution

- **If the old timing belt is to be reused, install it so that the arrow marked during removal procedures points in the turning direction.**

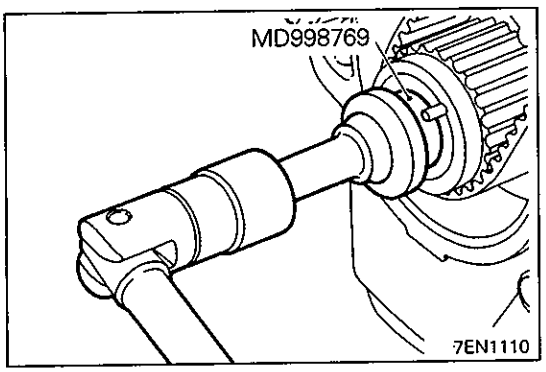
(7) Check that the timing mark is aligned on the intake camshaft sprocket. Then install the timing belt and secure it with a paper clip.



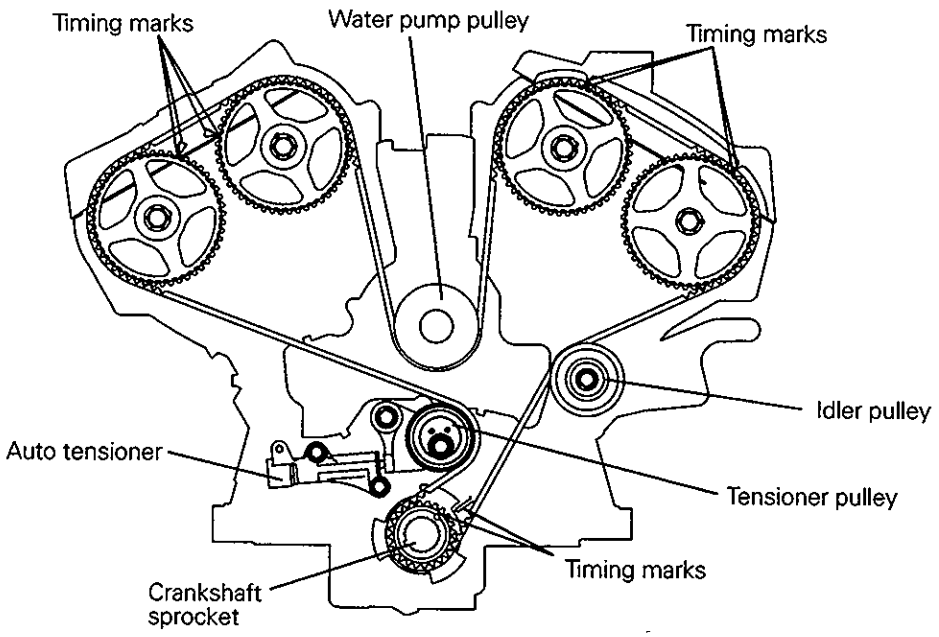
(8) Place the timing belt around the water pump pulley.
(9) Check that the timing marks of the camshaft sprockets on the left bank side are in alignment. Then install the timing belt over the sprockets and secure it with paper clips.
(10) Place the timing belt around the idler pulley.
(11) Place the timing belt around the crankshaft sprocket.
(12) Place the timing belt around the tensioner pulley.

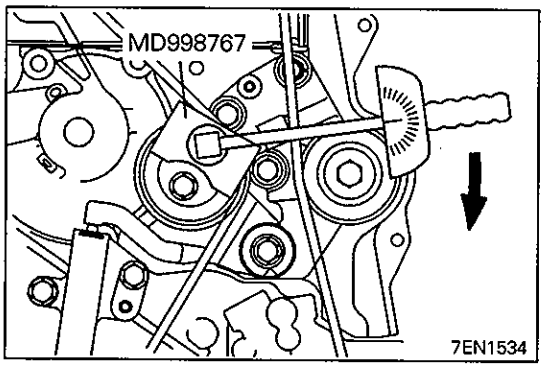


(13) Make sure that the tensioner pulley is positioned so that its pinhole is on the upper side. Then, lightly press the tensioner pulley against the timing belt and temporarily tighten the fixing bolt.
(14) Remove all four paper clips.
(15) Turn the crankshaft one tooth clockwise.
(16) Check that the timing mark of each sprocket is properly aligned.

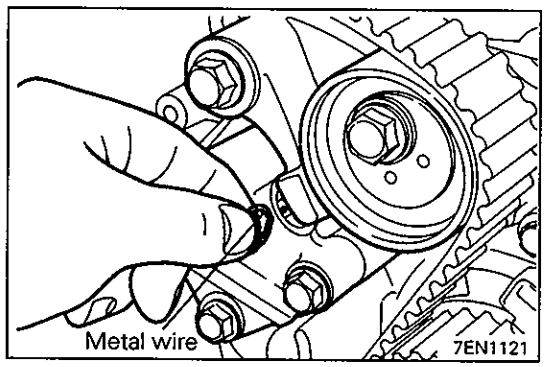


(17) Turn the crankshaft 1/4 turns counterclockwise. Then, turn it clockwise and check that the timing marks are properly aligned.





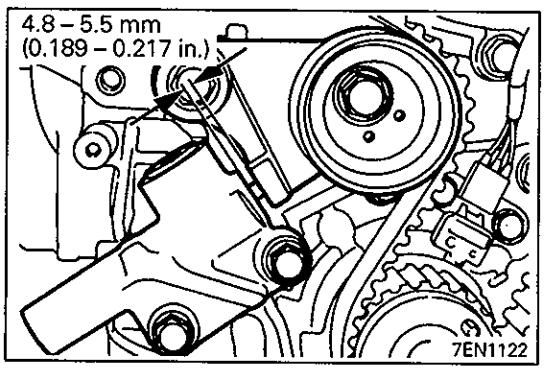
(18) Loosen the center bolt of the tensioner pulley and install the special tool and torque wrench. Apply a torque of 4.4 Nm {0.45 kgfm, 3.25 ft.lbs.} to prevent the tensioner pulley from turning together, tighten the center bolt to the specified torque.



(19) Turn the crankshaft two complete turns clockwise and leave it to stand for about 5 minutes.

(20) Check to see if the metal wire, which has been inserted during installation procedures, can be removed easily from the auto-tensioner.
If it can be removed with a light force, it indicates that the belt tension is appropriate. Now, remove the metal wire. Another indication of an adequate belt tension is that the protrusion of the rod of the auto-tensioner falls within the standard value range.

Standard value: 4.8 – 5.5 mm (0.139 – 0.217 in.)



(21) If the metal wire cannot be pulled out easily, repeat steps (18) and (19) until an adequate tension is obtained.